

Two new species of *Simulium* (*Montisimulium*) (Diptera: Simuliidae) from Northern Thailand

Hiroyuki TAKAOKA¹⁾ and Wej CHOCHOTE²⁾

¹⁾ Department of Infectious Disease Control, Faculty of Medicine, Oita University,
Hasama, Oita, 879-5593 Japan

²⁾ Department of Parasitology, Faculty of Medicine, Chiang Mai University,
Chiang Mai 50200, Thailand

(Received: 28 October 2004; Accepted: 9 December 2004)

Abstract: Two new species of *Simulium* (*Montisimulium*), *S. (M.) merga* sp. nov. and *S. (M.) surachaii* sp. nov., are described based on specimens collected at high elevation (2,560 m above sea level) in Doi Inthanon National Park, Northern Thailand. *Simulium (M.) merga* sp. nov. (known for female, male, pupa and mature larva) is distinguished from all the known species of the subgenus by the large paired elements of the pupal gill with 14 slender filaments. *Simulium (M.) surachaii* sp. nov. (only the female adult is known) is easily distinguished from *S. (M.) merga* by the much smaller claw tooth.

Key words: black fly, Simuliidae, *Simulium*, Thailand, new species, *Montisimulium*

In Thailand, *Simulium* (*Montisimulium*) Rubtsov, a small subgenus in the Oriental and Palaearctic Regions, is represented by only one unnamed species, *S. (M.)* sp. G (Kuvangkadilok et al., 1998; Takaoka and Choochote, 2004). During recent surveys on black flies in Northern Thailand, we collected six pupae and several mature larvae of *Simulium* (*Montisimulium*) in a mountainous stream (altitude 2,560 m) at Ang Ka in Doi Inthanon National Park, and obtained two female and two male adults emerged from four of the six pupae collected. After comparison with the known species of this subgenus, this species is described here as a new species. In addition, another new species belonging to the same subgenus is also described from a single adult female collected while attracted to a human at the same locality.

The terms for morphological features used here follow those of Takaoka (2003). Holotype and paratype specimens of the new species are deposited at the Department of Infectious Disease Control, Oita University.

Simulium (*Montisimulium*) *merga* sp. nov.

DESCRIPTION. Female. Body length 2.7 mm. **Head.** Slightly narrower than thorax. Frons (Fig. 1A) blackish brown, thinly whitish-grey pruinose, slightly shiny at certain angle of light, densely covered with yellow recumbent hairs interspersed with several dark longer and stouter hairs along each lateral margin. Frontal ratio 1.7:1.0:2.3. Frons-head ratio 1.0:5.2. Fronto-ocular area (Fig. 1B) well developed, triangular, directed laterally and somewhat upwardly. Clypeus blackish brown, thinly whitish-grey pruinose, slightly shiny at certain angle of light, densely covered with yellow recumbent hairs (except narrow portion near upper margin bare) intermixed with several dark longer and stouter hairs along lateral margins and near lower margin. Labrum 0.93 times as long as clypeus. Antenna (Fig. 1C) composed of 2+9 segments, blackish brown, except scape, pedicel, and minute base of 1st flagellar segment yellow to yellowish brown; 1st flagellar segment 1.7 times as long as 2nd one. Maxillary palp (Fig. 1D) consisting of 5 segments, dark yellow on 1st and 2nd segments, brownish black on segment 3, and dark grey on 4th and 5th segments, proportional

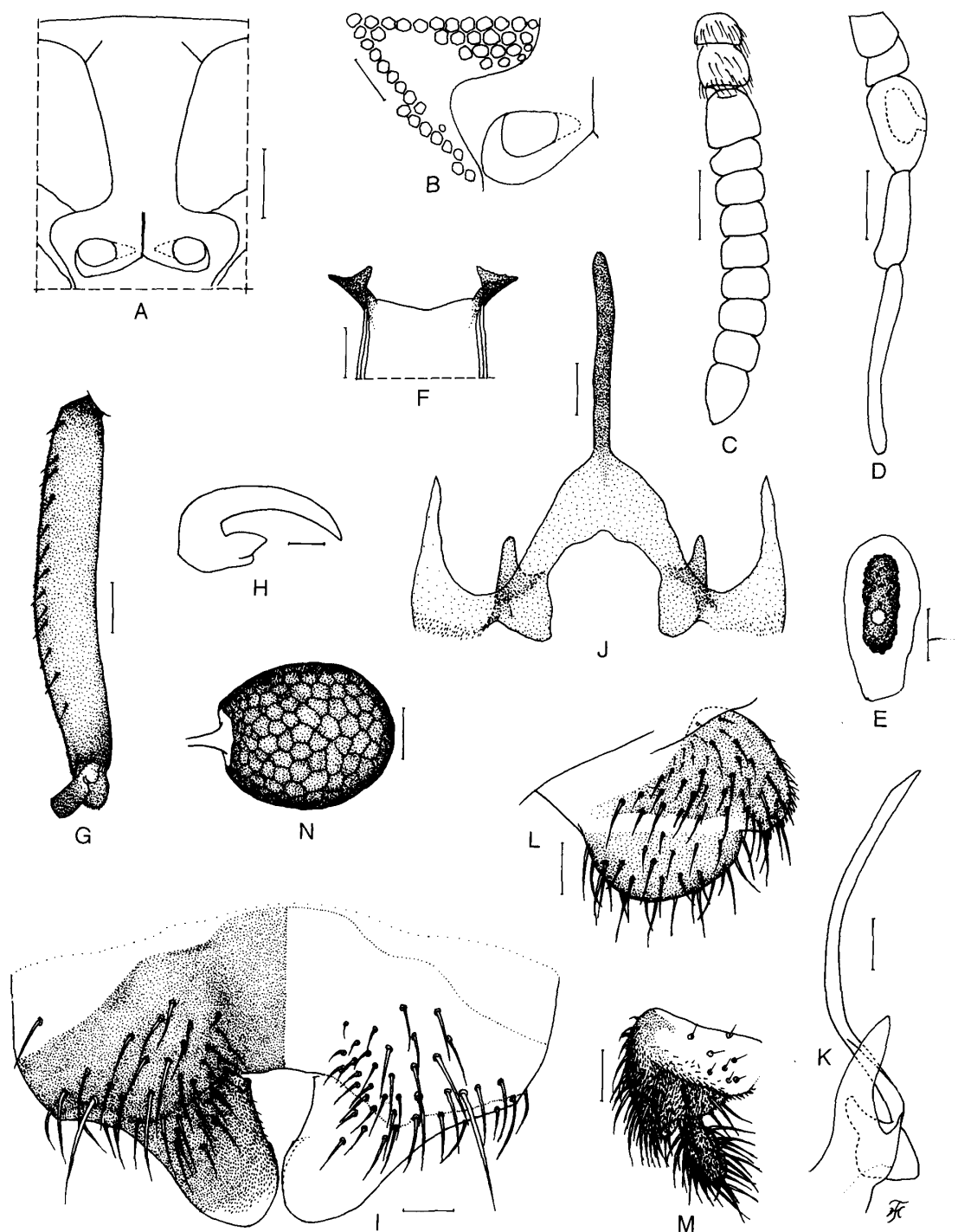


Fig. 1. Adult female of *Simulium* (*Montisimulium*) *merga* sp. nov. A, frons; B, fronto-ocular area (right side, frontal view); C, antenna (right side, dorsal view); D, maxillary palp (right side, outer view); E, 3rd maxillary palpal segment with sensory vesicle; F, upper portion of cibarium (front view); G, hind basitarsus and 2nd tarsal segment (left side, outer view); H, claw; I, 8th sternite, ovipositor valves; J and K, genital forks (J, ventral view; K, lateral view); L and M, paraprocts and cerci (right side) (L, outer view; M, ventral view); N, spermatheca (lateral view). Scales. 0.1 mm for A, C, D and G; 0.05 mm for B, E and F; 0.03 mm for I-N; 0.01 mm for H.

lengths of 3rd, 4th, and 5th segments 1.0 : 1.0 : 1.9; 3rd segment much enlarged; sensory vesicle (Fig. 1E) elongate, 2.9 times as long as wide, and 0.6 times as long as 3rd segment. Lacinia

with 8 inner and 13 outer teeth. Mandible with ca. 22 inner teeth and lacking outer ones. Cibarium (Fig. 1F) smooth on posterior margin, with well-sclerotized arms directed anterolaterally.

Thorax. Scutum nearly black except narrow portions along both lateral margins and on prescutellar area brownish black (and also thinly whitish-grey pruinose), and shiny at certain angle of light; scutum densely covered with yellow recumbent hairs mixed with several dark-brown upright long hairs on prescutellar area. Scutellum yellowish brown, with many dark upright long hairs as well as yellow shorter hairs. Postnotum dark brown, slightly shiny at certain angle of light, bare. Pleural membrane bare. Katepisternum longer than deep, dark brown, shiny in light and bare.

Legs. Foreleg: coxa dark greyish yellow; trochanter dark grey; femur dark greyish-yellow with apical cap dark brown; tibia dark brown with median portion largely light brown on outer and anterior surfaces; tarsus blackish; basitarsus very slightly dilated, about 9.0 times as long as its greatest width. Midleg: coxa yellowish grey with posterior surface dark brown; trochanter yellowish grey with posterior surface somewhat darker; femur dark greyish-yellow with apical cap dark brown; tibia medium to dark brown with median portion largely light brown on anterior and lateral surfaces, and with apical cap brownish black; tarsus black. Hind leg: coxa medium brown; trochanter yellow or yellowish grey; femur dark greyish-yellow with apical cap dark brown; tibia dark brown with median portion largely light brown on outer and inner surfaces; tarsus brownish black to black except median portion of basitarsus extensively light brown and basal 2/5 of 2nd tarsal segment yellowish; basitarsus (Fig. 1G) nearly parallel-sided on basal 1/2 or a little more, then somewhat narrowed toward apex, 6.3 times as long as its greatest width, 0.79 and 0.62 times as wide as the greatest widths of tibia and femur, respectively; calcipala well developed, 1.1 times as long as wide, and half as wide as the greatest portion of basitarsus; pedisulcus well developed. All claws (Fig. 1H) each with medium-sized basal tooth 0.38 times as long as claw.

Wing. Length 2.9–3.0 mm. Costa with 2 parallel rows of dark short spines as well as dark hairs. Subcosta with dark hairs except near apex bare. Hair tuft on stem vein dark. Basal portion of radius fully haired. R_1 with dark spinules and hairs. R_2 with dark hairs only. Basal cell absent.

Abdomen. Basal scale light brown, with fringe of whitish-yellow long hairs. Dorsal surface of abdomen medium to dark brown except

that of segment 2 ochereous (though tergite medium brown), moderately covered with whitish-yellow short hairs interspersed with dark ones; tergites 2, 6–8 shiny at certain angle of light (tergites 3–5 also slightly shiny at certain angle of light); ventral surface of abdomen ochereous on segments 2–4, light to medium brown on segments 5–8; segment 7 with shiny large sternal plate medially.

Genitalia. Sternite 8 (Fig. 1I) wide, bare medially but furnished with 35–37 short and long hairs on each side. Ovipositor valve (Fig. 1I) tongue-like, produced posteromedially, thin, membranous (except inner margin narrowly sclerotized), densely covered with microsetae (except narrow portion along posterior margin bare) interspersed with 4–8 short hairs; inner margins widely separated basally from each other, approaching closely to each other along apical 2/5; inner margin with wide bare lobe (somewhat sclerotized near base) protruding dorsally along posterior 2/3. Genital fork (Fig. 1J) inverted-Y-shaped, with well sclerotized stem and wide arms, and with a narrow incision between arms; stem curved dorsally (Fig. 1K); each arm produced posteromedially in form of a wide triangular plate, and with a distinct projection directed anterodorsally on dorsal surface; each arm connected apicolaterally to thinly sclerotized plate markedly produced anteriorly. Paraproct of usual shape, only slightly protruding ventrally, with ca. 42 short to long hairs on ventral and lateral surfaces (Fig. 1L), and with 8 sensilla on anteromedial surface (Fig. 1M). Cercus in lateral view rounded posteriorly, about half as long as wide (Fig. 1L). Spermatheca (Fig. 1N) ovoidal, strongly sclerotized (except area around its juncture with duct unsclerotized), with distinct reticulate surface pattern, and with internal setae; accessory ducts subequal in diameter to each other and slightly larger in diameter than that of main duct.

Male. Body length 3.0 mm. **Head.** Slightly wider than thorax. Holoptic. Upper eye consisting of large facets in 21 or 22 vertical columns and 22 or 23 horizontal rows. Clypeus brownish black, white pruinose, shiny at certain angle of light, and moderately covered with dark simple long and pale shorter hairs. Antenna composed of 2+9 segments; entirely brownish black except base of 1st flagellar segment slightly paler (in 1 male, antenna dark brown except scape, pedicel, and base of 1st flagellar

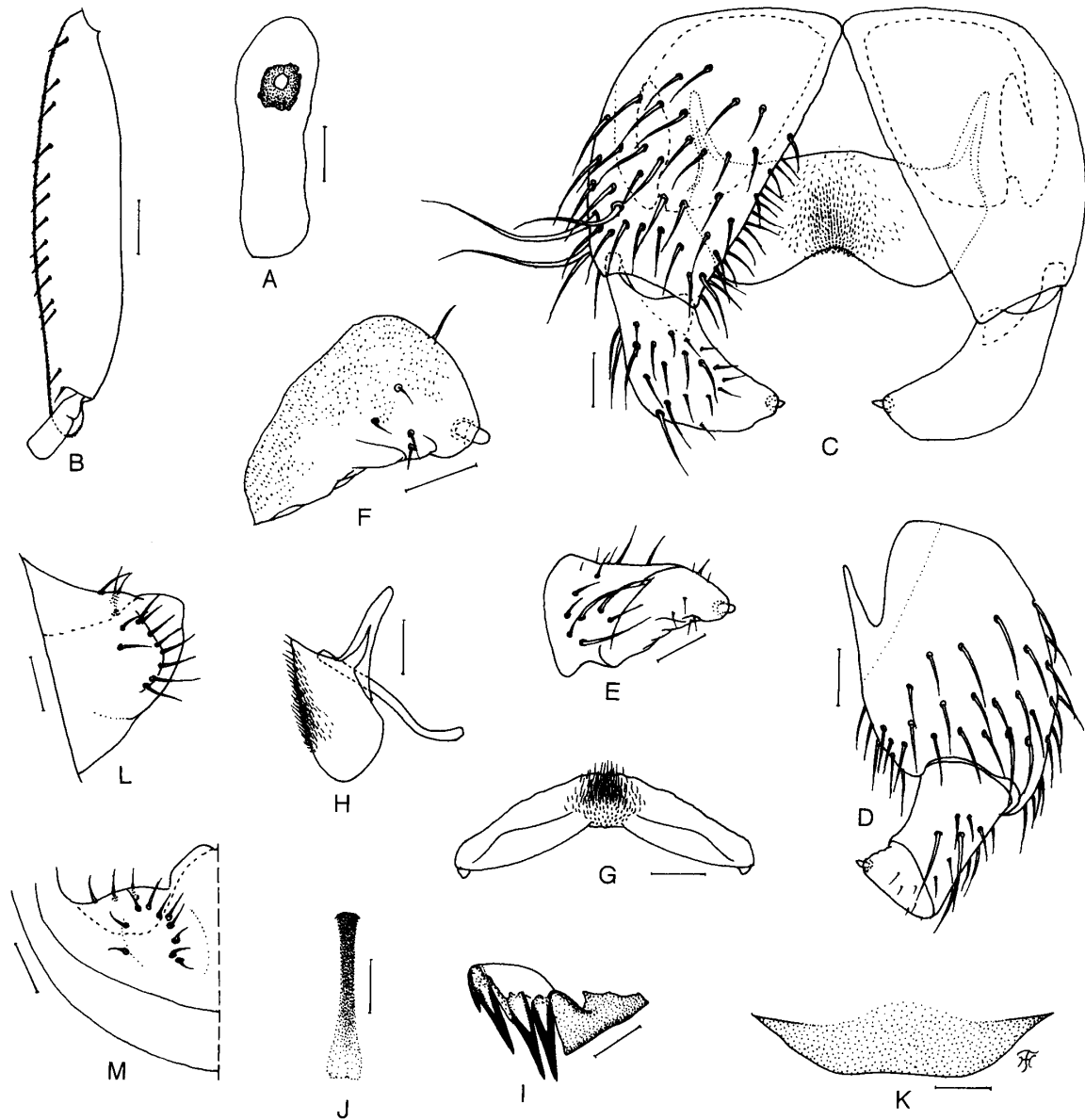


Fig. 2. Adult male of *Simulium* (*Montisimulium*) *merga* sp. nov. A, 3rd segment of maxillary palp (right side, frontal view); B, hind basitarsus and 2nd tarsal segment (left side, outer view); C, coxite, style and ventral plate *in situ* (ventral view); D, coxite and style *in situ* (right side, lateral view); E, style (right side, end view); F, posterolateral surface of style (right side, end view); G, ventral plate (end view); H, ventral plate and median sclerite (lateral view); I, paramere with 4 hooks (left side, end view); J, median sclerite (end view); K, dorsal plate; L and M, 10th abdominal segments and cerci (L, right side, lateral view; M, right half, end view). Scales. 0.1 mm for B; 0.03 mm for A, C-E and G-M; 0.02 mm for F.

segment somewhat paler); 1st flagellar segment elongate, 1.9–2.1 times as long as 2nd one. Maxillary palp composed of 5 segments, light to medium brown, proportional lengths of 3rd, 4th, and 5th segments 1.0 : 1.1 : 2.2; 3rd segment of moderate size; sensory vesicle (Fig. 2A) ellipsoidal, about 0.2 times as long as 3rd segment. **Thorax.** Scutum nearly black, somewhat shiny at certain angle of light, and densely covered with yellow recumbent hairs mixed

with dark similar hairs on anterior portions, and with several dark brown upright long hairs on prescutellar area. Scutellum medium brown, with many dark upright long hairs as well as yellow shorter hairs. Postnotum dark brown, somewhat shiny at certain angle of light, bare. Pleural membrane and katapisternum as in female. **Legs.** Medium brown to black except fore coxa light brown. Fore basitarsus cylindrical, only slightly dilated, about 9.4 times as

long as its greatest width. Hind basitarsus (Fig. 2B) swollen, slightly spindle-shaped, 4.5 times as long as its greatest width, 0.93 and 1.0 times as wide as the greatest widths of hind tibia and femur, respectively; calcipala (Fig. 2B) well developed, nearly as long as its width at base, and 0.38 times as wide as the greatest width of basitarsus; pedisulcus well developed. **Wing.** Length 2.7 mm. Other characters as in female except subcosta bare. **Abdomen.** Basal scale dark brown with fringe of dark long hairs. Dorsal surface of abdomen entirely blackish, and moderately covered with dark simple hairs; ventral surface ochreous to medium brown except sternites 3–8 dark brown. **Genitalia.** Coxite (Fig. 2C, D) subquadrate, much longer than wide. Style short, 0.6 times as long as coxite, broad, bent inward, rounded apically when viewed ventrally (Fig. 2C), somewhat depressed posterodorsally (Fig. 2E, F) and with a spine at apex; posterodorsal surface (Fig. 2F) well pigmented, with a few short setae as well as numerous microsetae on outer 1/2 or a little more. Ventral plate (Fig. 2C, G, H) lamellate, much shorter than wide, well sclerotized, with posterior margin deeply concave when viewed ventrally, and moderately covered with fine short setae medially on ventral and posterior surfaces; arm of moderate length, slender, somewhat directed outward. Paramere (Fig. 2I) with 3 large and 1 small hooks. Median sclerite (Fig. 2J) simple, narrow, club-shaped. Aedeagal membrane with simple minute spines. Dorsal plate (Fig. 2K) broad, well sclerotized. Ventral surface of 10th segment (Fig. 2L, M) with 3 or 4 hairs (though additional 1 hair situated on lateral surface in 1 male) near each posterolateral corner. Cercus (Fig. 2L, M) small, low in lateral view, encircled with 10 or 11 simple hairs.

Pupa. Body length 3.0–3.8 mm. **Head** (Fig. 3A). Integument dark yellow to light brown, moderately covered with tubercles of various shapes each having several very minute nodule-like secondary projections on surface (Fig. 3B); antennal sheath densely covered with similar tubercles; frons with 2 short slender simple trichomes on each side, face with 1 medium-long simple trichome (ca. 1.4 times as long as frontal trichomes) on each side. **Thorax.** Integument dark yellow to light brown, moderately covered with tubercles similar to those on head, with 2 very long slender simple trichomes with coiled apex mediodorsally (Fig. 3C), 2 slender simple trichomes (1 very long and

with coiled apex, 1 medium-long and with uncoiled apex) mediolaterally (Fig. 3D), 1 long slender simple trichome with uncoiled apex posterolaterally (Fig. 3E), and 2 slender simple trichomes with uncoiled apex (1 long, 1 short) ventrolaterally (Fig. 3F), on each side. Gill (Fig. 3G, H) composed of 2 inflated tubal trunks arising from short common basal stalk, one directed forward and with 6 slender thread-like filaments, and the other directed upward and forward and with 8 slender thread-like filaments at and near apex; 2 trunks light to medium brown, subequal in length (1.6–2.0 mm long) and thickness to each other, with distinct reticulate patterns in its surface formed by lines of minute tubercles (much larger ones on points of intersections), and moderately covered with very minute tubercles on interspaces (Fig. 3I); all slender filaments light to medium brown, subequal in length (1.0–1.6 mm long) and thickness to one another, densely covered with very minute tubercles, and without annular ridges. **Abdomen.** Dorsally, all segments weakly or moderately sclerotized and yellowish or yellowish brown; segments 1 and 2 sparsely tuberculate; segment 1 with 1 medium-long slender seta on each side; segment 2 with 1 medium-long slender seta and 5 short spinous setae on each side; segments 3 and 4 light brown, each with 4 hooks and 1 spinous seta on each side; segment 5 bare or with 1 or 2 spine-combs on each side; segments 6–8 each with spine-combs directed backward in transverse row on each side; segments 6–9 each with comb-like groups of minute spines on each side; terminal hooks distinct, horn-shaped and curved anteriorly (Fig. 3J). Laterally, segments 2–4 each with 3 spinous setae on each side; segment 9 with 3 distinct grapnel-like hooklets on each side (Fig. 3K). Ventrally, segments 3–7 nearly transparent and segments 8 and 9 weakly or moderately sclerotized and yellow to yellowish brown; segments 3–8 with comb-like groups of minute spines; segment 4 with 2 simple spinous setae submedially and a few slender setae on each side; segment 5 with a pair of bifid hooks submedially and a few slender setae on each side; segments 6 and 7 each with 1 bifid hook submedially, 1 simple hook laterally and a few slender setae on each side. **Cocoon** (Fig. 3G). Wall-pocket-shaped, moderately woven with no or very small open spaces in webs, with anterodorsal

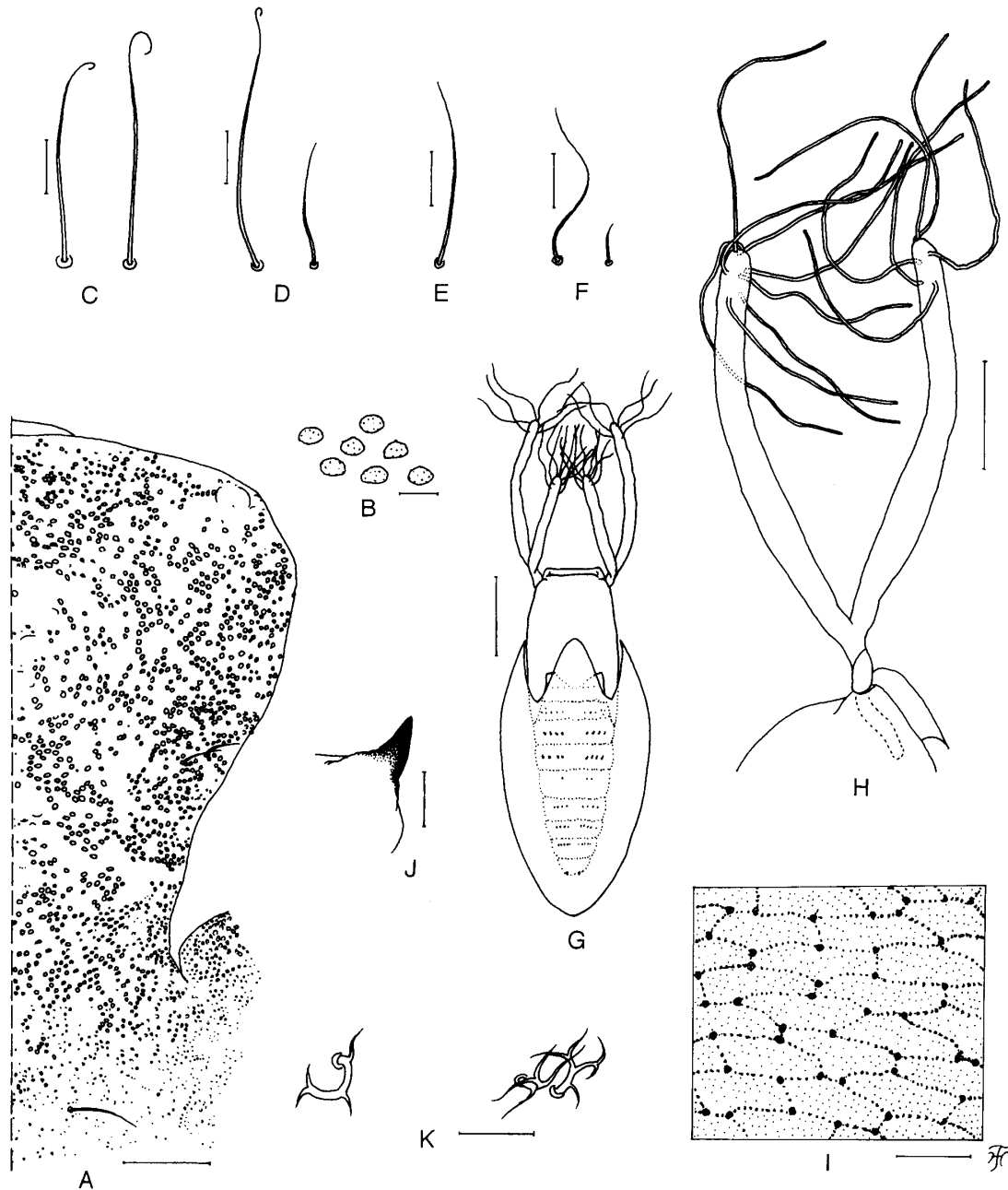


Fig. 3. Pupa of *Simulium* (*Montisimulium*) *merga* sp. nov. A, frons, upper part of face, and basal part of antennal sheath (left half); B, tubercles with secondary minute projections on frons; C-F, trichomes on thorax (C, mediodorsal; D, mediolateral; E, posterolateral; F, ventrolateral); G, pupa and cocoon (dorsal view); H, pupal gill filaments (right side, outer view); I, enlargement of inflated element showing elaborate reticulate surface patterns; J, terminal hook (left side, lateral view); K, grapnel-shaped hooklets on left side of 9th abdominal segment *in situ*. Scales. 1.0 mm for G; 0.5 mm for H; 0.1 mm for A; 0.03 mm for C-F and J; 0.02 mm for I and K; 0.01 mm for B.

projection, and not or slightly extending ventrolaterally; individual threads visible; 3.5–3.6 mm long by 1.4–2.0 mm wide.

Mature larva. Body length 7.5–8.2 mm. Body light whitish-yellow to somewhat greyish-yellow, with a pair of light reddish-brown small submedial spots dorsally on each of ab-

dominal segments 3–5 (though those on segments 3 and 4 usually faint, then not discernible); abdomen, when viewed dorsally, equally narrow from segment 1 to segment 4, abruptly widened posteriorly from anterior margin of segment 5 to anterior margin of segment 6, then gradually narrowed toward segment 9;

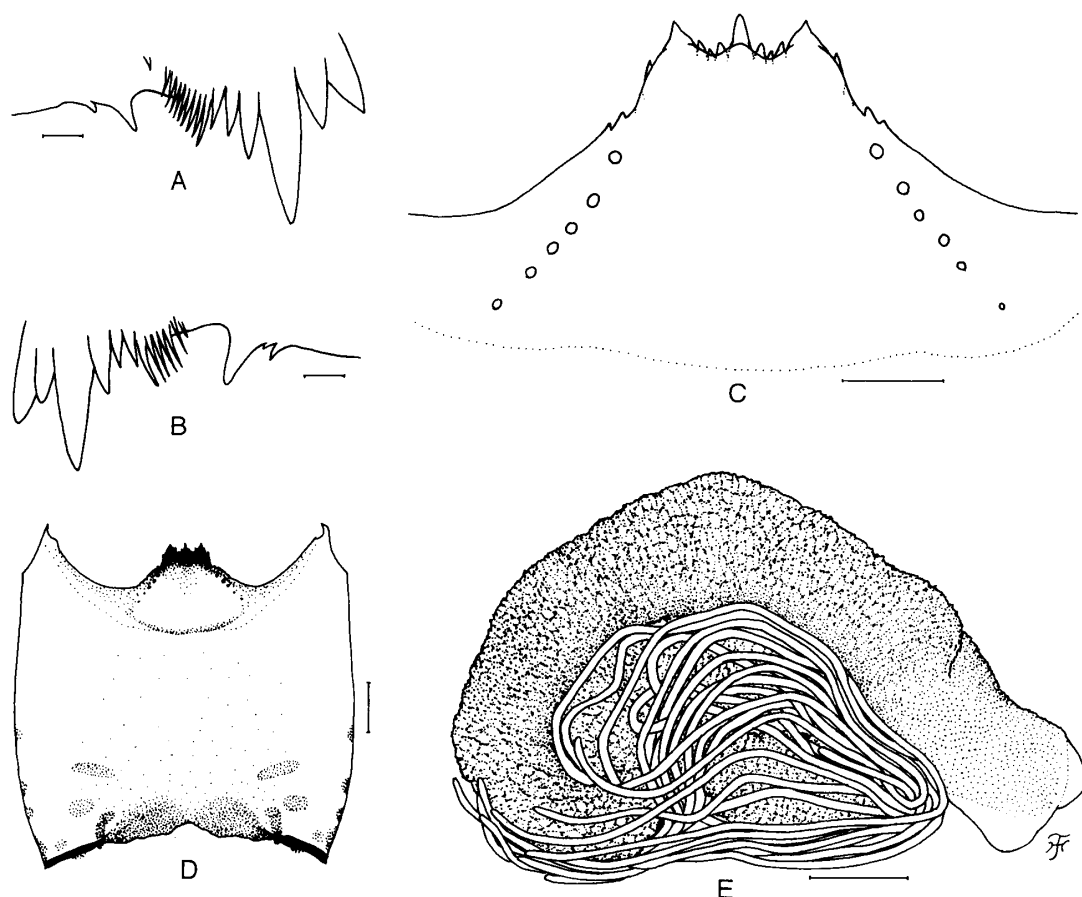


Fig. 4. Mature larva of *Simulium* (*Montisimulium*) *merga* sp. nov. A, apex of mandible (right side); B, apex of mandible with an extra serration (left side); C, hypostomium (ventral view); D, head capsule showing minute postgenal cleft (ventral view); E, pharate pupal gill. Scales. 0.1 mm for D and E; 0.05 mm for C; 0.01 mm for A and B.

maximum width near border between segments 5 and 6 (though maximum width on segment 6 when viewed laterally). Cephalic apotome clear yellow (though lighter anteriorly), with well-defined positive head-spots; lateral surface of head capsule clear yellow, with faint to moderate narrow eyebrow; 2 large and 2 (or 3) small spots near posterior margin and 1 small spot just below eye-spot region distinctly positive; ventral surface of head capsule yellow (though postgenal bridge slightly darkened), with dark basal area on each side of postgenal cleft; horizontal and round spots on each side of postgenal cleft distinctly positive. Cervical sclerites composed of 2 small elliptical pieces, not fused to occiput, very widely separated medially from each other. Antenna consisting of 3 segments and apical sensillum, much longer than stem of labral fan; proportional lengths of 1st, 2nd, and 3rd segments 1.0 : 0.7 : 1.1. Labral fan with ca. 30 main rays. Mandible (Fig. 4A) with mandibular serrations

consisting of 2 teeth (1 large, 1 small); large tooth at an acute angle to the mandible on apical side; comb-teeth composed of 3 teeth, of which 1st tooth longest, and 2nd and 3rd subequal in length to each other; supernumerary serrations usually absent (though left mandible of 1 larva with 1 minute tooth between 2 mandibular teeth as shown in Fig. 4B). Hypostomium (Fig. 4C) with 9 apical teeth in row; median and corner teeth well developed; median tooth of 3 intermediate teeth on each side smallest; lateral serrations weakly developed anteriorly; 4–6 hypostomal bristles per side, lying slightly divergent posteriorly from lateral margin. Postgenal cleft absent or very small, vestigial (Fig. 4D). Pharate pupal gill (Fig. 4E) composed of 2 inflated trunks with 14 thread-like filaments. Abdominal cuticle bare except both sides of anal sclerite moderately covered with simple colorless setae. Rectal scales present. Rectal organ compound, each of 3 lobes with 11–14 finger-like secondary lob-

ules on posterior surface. Anal sclerite X-shaped, with anterior arms 0.8 times as long as posterior ones; sensilla absent on and just posterior to basal juncture area; accessory sclerite absent. Last abdominal segment much expanded ventrally forming double bulges on each side, visible as a large ventral papilla when viewed from side. Posterior circlet with ca. 86 rows of up to 14 hooklets per row.

TYPE SPECIMENS. Holotype female (emerged from a pupa) with its associated pupal exuvia and cocoon, collected at Site A, Ang Ka, Doi Inthanon National Park, Chiang Mai, Thailand, 5.X.2004, by W. Choochote. Paratypes: 1 female and 2 males with their associated pupal exuviae and cocoons, same data as holotype except date, 4.XI.2004; 1 male (dissected out of a pupa) with its associated pupal exuvia and cocoon, same data as holotype; 1 pupa and 4 mature larvae, same data as holotype except date, 8.IX.2004; 2 mature larvae, same data as holotype except date, 10.XII.2003.

ECOLOGICAL NOTES. The pupae and larvae of this new species were found on the surface of leaves and stalks of trailing ferns and grasses in a small forest stream (water temperature 6.5–14.0°C, shaded, altitude 2,560 m). Associated species were *Simulium* (*Nevermannia*) *caudiscle-rum* Takaoka and Davies, *S. (Simulium)* *rufibasis* Brunetti, *S. (S.) setsukoe* Takaoka and Choochote, and *S. (S.) suchariti* Takaoka and Choochote.

DISTRIBUTION. Thailand.

ETYMOLOGY. The specific name *merga* is a Latin noun for a two-pronged fork and refers to the large paired elements of the pupal gill.

REMARKS. *Simulium merga* sp. nov. is readily assigned to the subgenus *Simulium* (*Montisimulium*) [originally defined as a genus by Rubtsov (1974)] by the combination of the following characters: in both

female and male, radial vein fully haired on basal portion, and both pleural membrane and katepisternum bare; in female, claw with a medium-sized tooth (Fig. 1H) and ovipositor valves tongue-like (Fig. 1I); in male, ventral plate simple and lamellate (Fig. 2C), style short and inwardly-twisted (Fig. 2C), paramere with several parameral hooks (Fig. 2I); in pupa, gill with 14 thread-like filaments (Fig. 3H); and in larva, postgenal cleft absent or very small (Fig. 4D).

This new species is remarkable in having the pupal gill composed of two inflated elements from which 14 thread-like filaments arise (Fig. 3H). In this aspect, this new species seems to be related to *S. (M.) dasguptai* Datta from India. However, the pupal gill consists of one inflated element with 14 thread-like filaments in the Indian species (Datta, 1974).

The male and female of this new species resemble those of *S. (M.) kambaitense* Takaoka, described based on male and female specimens collected from Myanmar (Takaoka, 1989). However this species is distinguished from the latter species by the following characters (parenthesis in *S. (M.) kambaitense*): in the male, large eye facets in 21 or 22 vertical columns and 22 or 23 horizontal rows (in 19 vertical columns and 19 horizontal rows), and the posterolateral membranous surface of the style well pigmented, and covered with microsetae at least on its outer half (mostly transparent and bare); in the female, frons-head ratio 1 : 5.2 (1 : 4.8), sensory vesicle 2.9 times as long as wide (2.2 times), mandible with 22 teeth on inner margin (ca. 28 teeth), and fore basitarsus about 9.0 times as long as its greatest width (about 7.4 times).

It remains undetermined whether this new species is conspecific to *S. (M.)* sp. G since no morphological characteristics have been noted in this unnamed species (Kuvangkadilok et al., 1998)

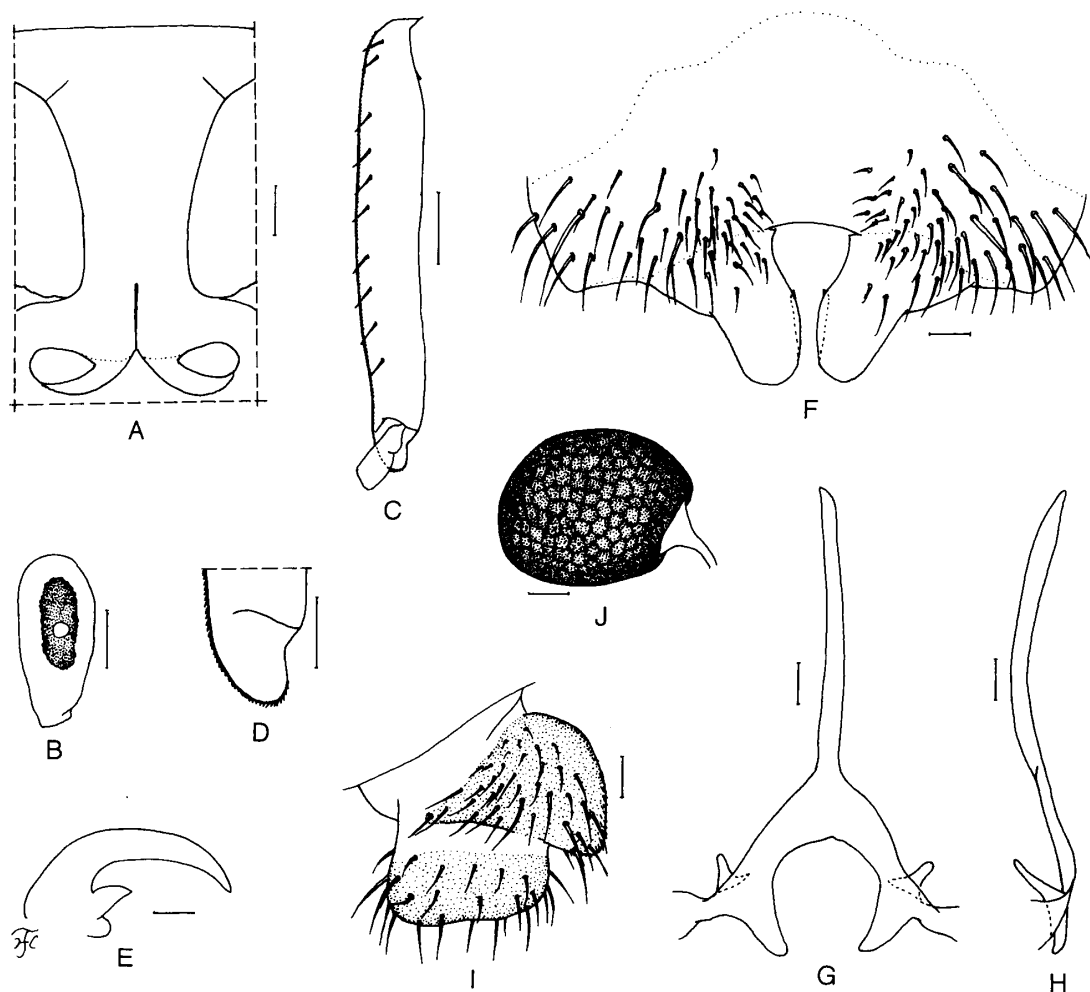


Fig. 5. Adult female of *Simulium (Montisimulium) surachaii* sp. nov. A, frons; B, 3rd maxillary palpal segment with sensory vesicle; C, hind basitarsus and 2nd tarsal segment (left side, outer view); D, calcipala (left side, outer view); E, claw; F, 8th sternite and ovipositor valves; G and H, genital forks (G, ventral view; H, lateral view); I, paraproct and cercus (right side, outer view); J, spermatheca (lateral view). Scales. 0.1 mm for C; 0.05 mm for A, B and D; 0.02 mm for F–J; 0.01 mm for E.

***Simulium (Montisimulium) surachaii* sp. nov.**

DESCRIPTION. Female. Body length 2.5 mm. **Head.** Slightly narrower than thorax. Frons (Fig. 5A) blackish brown, thinly whitish-grey pruinose, shiny at certain angle of light, and densely covered with yellow hairs interspersed with several dark longer and stouter hairs along each lateral margin. Frontal ratio 1.8:1.0:2.0. Frons-head ratio 1.0:4.2. Fronto-ocular area well developed, triangular, directed laterally and somewhat upwardly, as in *S. (M.) merga*. Clypeus blackish brown, thinly whitish-grey pruinose, slightly shiny at certain angle of light, densely covered with yellow hairs intermixed with several dark longer and stouter hairs along lateral margins and near lower margin. Labrum 0.98 times as long as clypeus.

Antenna composed of 2+9 segments, blackish brown, except scape, pedicel, and extreme base of 1st flagellar segment yellow; 1st flagellar segment 1.6 times as long as 2nd one. Maxillary palp consisting of 5 segments, light to medium brown except 3rd segment dark brown, proportional lengths of 3rd, 4th, and 5th segments 1.0:0.9:1.5; 3rd segment much enlarged; sensory vesicle (Fig. 5B) elongate, 2.7 times as long as wide, and 0.53 times as long as 3rd segment. Lacinia with 8 inner and 12 outer teeth. Mandible with ca. 22 inner teeth and lacking outer ones. Cibarium smooth on posterior margin, similar to that of *S. (M.) merga*. **Thorax.** Nearly as in female of *S. (M.) merga* except scutellum medium brown. **Legs.** Color nearly as in female of *S. (M.) merga*. Fore basitarsus very slightly dilated, 8.7 times as long as

its greatest width. Hind basitarsus (Fig. 5C) nearly parallel-sided on basal 3/4 or a little more, then somewhat narrowed toward apex, 6.3 times as long as its greatest width, 0.80 and 0.67 times as wide as the greatest widths of tibia and femur, respectively; calcipala (Fig. 5D) moderately developed, 0.81 times as long as wide, and half as wide as the greatest portion of basitarsus; pedisulcus well developed. All claws (Fig. 5E) each with medium-sized basal tooth 0.28 times as long as claw. **Wing.** Length 2.5 mm. Other characters as in female of *S. (M.) merga*. **Abdomen.** Nearly as in female of *S. (M.) merga* except 2nd segment with medium brown area on each dorsolateral surface. **Genitalia.** Sternite 8 (Fig. 5F) wide, bare medially but furnished with 38–41 short and medium-long hairs on each side. Ovipositor valve (Fig. 5F) tongue-like, produced posteromedially, thin, membranous (except inner margin narrowly sclerotized), densely covered with microsetae (except narrow portion along posterior margin bare) interspersed with 9 or 10 short hairs; inner margins widely separated basally from each other, approaching closely to each other along apical 1/2; inner margin with wide bare lobe (somewhat sclerotized near base) protruding dorsally along posterior 1/2. Genital fork (Fig. 5G) inverted-Y-shaped, with well sclerotized stem and wide arms; stem slightly curved dorsally (Fig. 5H); each arm produced posteromedially in form of a subtriangular plate, and with a distinct narrow projection directed anterodorsally on dorsal surface. Paraproct (Fig. 5I) of usual shape, somewhat protruding ventrally, with ca. 38 short to medium-long hairs on ventral and lateral surfaces, and with 11 or 12 sensilla on anteromedial surface. Cercus (Fig. 5I) in lateral view subquadrate, about half as long as wide. Spermatheca (Fig. 5J) ovoidal, strongly sclerotized (except area around its juncture with duct unsclerotized), with distinct reticulate surface pattern, and with internal setae; accessory ducts subequal in diameter to each other and slightly larger in diameter than that of main duct.

Male, Pupa and Mature larva. Unknown.

TYPE SPECIMEN. Holotype female collected by hand net, at Site A, Ang Ka, Doi Inthanon National Park, Chiang Mai, Thailand, 25.VII.2004, by W. Choochote.

ECOLOGICAL NOTES. The female of this new species was collected while attracted to a human together with *S. (S.) rufibasis* during 16.00–17.00 hours. The female was gravid containing numerous mature eggs in the abdomen.

DISTRIBUTION. Thailand.

ETYMOLOGY. The specific name *surachaii* is in honor of Mr. Surachai Tuam-somboon, Chief, Headquarters of Doi Inthanon National Park.

REMARKS. *Simulium surachaii* sp. nov. is readily assigned to the subgenus *Simulium* (*Montisimulium*) by the combination of the following female characters: radial vein fully haired on basal portion, both pleural membrane and katepisternum bare, claw with a medium-sized tooth (Fig. 5E) and ovipositor valves tongue-like (Fig. 5F).

The female of this new species resembles that of *S. (M.) merga* but differs by the following characters (*S. (M.) merga* in parenthesis): frons-head ratio 1.0:4.2 (1.0:5.2), length of claw tooth against that of claw 0.28 (0.38), length/width ratio of calcipala 0.81 (1.1), the presence of a darkened area on each dorsolateral surface of the second abdominal segment (absence), the posteromedially directed projection of genital fork narrow (wide), and the cercus in lateral view subquadrate (rounded).

Simulium (M.) surachaii is also distinguished from *S. (M.) kambaitense* from Myanmar (Takaoka, 1989) by the smaller claw tooth (cf. 0.37 in *S. (M.) kambaitense*).

This new species is similar to *S. (M.) nemorivagum* Datta and *S. (M.) ghoomense* Datta, both from India (Datta, 1974; 1975) in many characters including the small claw tooth, but differs from both of the two known species by the absence of three longitudinal vittae on the scutum, also from *S. (M.) nemorivagum* by the relative size of sensory vesicle against the third maxillary palpal segment (0.53 in *S. (M.) surachaii* vs. 0.65 in *S. (M.) nemorivagum*),

and from *S. (M.) ghoomense* by the wide arms of the genital fork (cf. arms of the genital fork narrow apically in *S. (M.) ghoomense*).

There is no way at the present to associate the female of *S. (M.) surachaii* with the larva of *S. (M.)* sp. G, although both species were collected at the same mountainous area in Doi Inthanon National Park.

ACKNOWLEDGEMENTS

We are grateful to Mr. Surachai Tuamsomboon, Chief, Headquarters of Doi Inthanon National Park, Wildlife and Plant Conservation Department, Ministry of National Resources and Environment, for his permission to conduct this survey inside the park. We are grateful to Dr. R. W. Crosskey, Natural History Museum, London, U.K. for valuable suggestions on the new species name.

This work was financially supported by a Grant-in-Aid of Japan-US Medical Research Cooperation Program (the fiscal year 2004).

REFERENCES

- Datta, M. 1974. New species of black flies (Diptera: Simuliidae) from the Darjeeling area, India. *Orient. Insects*, 8: 457–468.
- Datta, M. 1975. A new black fly species (Simuliidae: diptera) from the Darjeeling area, India. *Proc. Indian Acad. Sci.*, 81: 67–74.
- Kuvangkadilok, C., Boonkemtong, C. and Phayuhasena, S. 1998. C-banding in polytene chromosomes of six *Simulium* species (Diptera: Simuliidae) from Doi Inthanon National Park, Northern Thailand. *J. Sci. Soc. Thailand*, 24: 215–230.
- Rubtsov, I. A. 1974. Evolution, phylogeny and classification of the family Simuliidae (Diptera). *Tr. Zool. Inst. AN SSSR*, 53: 230–281 (In Russian).
- Takaoka, H. 1989. Notes on blackflies (Diptera: Simuliidae) from Myanmar (formerly Burma). *Jpn. J. Trop. Med. Hyg.*, 17: 243–257.
- Takaoka, H. 2003. The Black Flies (Diptera: Simuliidae) of Sulawesi, Maluku and Irian Jaya. xxii + 581 pp., Kyushu University Press, Fukuoka.
- Takaoka, H. and Choochote, W. 2004. A list of and keys to black flies (Diptera: Simuliidae) in Thailand. *Trop. Med. Health*, 32: 189–197.